What Is Claimed Is:

1.   A packet forwarding apparatus, connected with a plurality of input lines and
output lines, which forwards each input packet received from each of the input lines
5   to an output line as identified by header information of the input packet,

the apparatus comprising:

a flow retrieval unit for comparing and matching the header information of
the input packet with a plurality sets of flow identification conditions each set of
which is used for classifying input packets into a flow and stored in one content
10   addressable memory (CAM) of the flow retrieval unit, and for outputting at least two
flow identifiers appropriate to the input packet concurrently to at least two header
processing units respectively corresponding to each of the flow identifiers;

said header processing units each of which incorporates an information table
including a plurality of information entries, reads a single information entry from the
15   information table according to the respective flow identifier outputted from the flow
retrieval unit, and executes a given arithmetic operation using the single information
entry; and

means for forwarding the input packet according to control information
which includes the executed result from at least one of the header processing units.
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2.   The packet forwarding apparatus as claimed in Claim 1, further comprising
a plurality of input line interfaces connected with said input lines, each of the input
line interfaces including:

a means for extracting from each input packet the header information and
25   supplying the extracted header information to the flow retrieval unit; and

a packet rewriting means for rewriting a portion of the header information according to the control information from at least one of the header processing units.

3.   The packet forwarding apparatus as claimed in Claim 2, wherein the flow
5   retrieval unit comprises a memory access control unit for generating a flow retrieval key from the header information received from the input line interfaces, and for concurrently accessing the CAMs with the flow retrieval key, wherein

each of the CAMs consists of a plurality of flow entries indicating the respective flow identification conditions, and
10   each of the header processing units reads an information entry from the information table according to the respective flow identifiers outputted_concurrently from the CAMs.

4.   The packet forwarding apparatus as claimed in Claim 3, wherein the CAMs
15   are accessed concurrently with the same flow retrieval key outputted from the memory access control unit.

5.   The packet forwarding apparatus as claimed in Claim 3, wherein at least one of the CAMs has a plurality of flow entries to be accessed with a flow retrieval key
20   other than the one used for the other CAMs; and

wherein the memory access control unit outputs the flow retrieval key in two forms, one form having common key fields for at least one common content addressable memory and the other form having specific key fields for at least one specific content addressable memory, the common and specific key fields are
25   selectively inputted as a flow retrieval key to at least one of the CAMs.

6.   The packet forwarding apparatus as claimed in Claim 2, wherein each of the input line interfaces has a means for providing the input packet with an respective internal header including at least an input line number, wherein the means for supplying the extracted header information to the flow retrieval unit supplies the header information including said internal header.

7.   The packet forwarding apparatus as claimed in Claim 1, wherein the header processing units concurrently execute arithmetic operations for performing at least two of collecting statistic information, service quality control, packet policy routing control, and packet filtering control, for each flow.

8.   The packet switching apparatus as claimed in Claim 1, wherein the flow identification conditions are defined based upon at least two of the group included in the packet header: a source address, a destination address, an application identifier at the source, an application identifier at the destination, and priority information of packet forwarding.

9.   A packet forwarding apparatus, connected with a plurality of input lines and output lines, which forwards each input packet received from each of the input lines to an output line as identified by header information of the input packet,
    the apparatus comprising:
    a plurality of input line interfaces connected with the input lines;
    a plurality of output line interfaces connected with the output lines;

a packet switch connected between the input line interfaces and the output line interfaces; and

a plurality of control units provided for each of the input line interfaces, each of the control units includes:

5   a means for receiving packet header information from one of the input line interfaces;

a flow retrieval unit which generates a flow retrieval key from the packet header information, compares the packet header information with a plurality sets of predetermined flow identification conditions each set of which is used for classifying

10   input packets into a flow and stored in one content addressable memory (CAM) of the flow retrieval unit, and outputs concurrently various flow identifiers which correspond to the retrieval key; and

a plurality of header processing units each of which has an information table containing a plurality of information entries and receives one of the flow identifiers

15   outputted from the flow retrieval unit, and each of the header processing units reads a single information entry from said information table according to a specific type of flow identifier outputted from the flow retrieval unit and executes an arithmetic operation with the information entry,

wherein each of the input line interfaces has a means for rewriting a portion

20   of the input packet header information according to control information which includes the executed result outputted from at least one of the header processing units.

10.   The packet forwarding apparatus as claimed in Claim 9, wherein the flow

25   retrieval unit further includes a memory access control unit for generating the flow

retrieval key from the header information outputted from the input line interfaces and

for concurrently accessing the CAMs with the flow retrieval key.

11.   A packet forwarding apparatus, connected with a plurality of input lines and

5   output lines, which forwards each input packet received from each of the input lines

to an output line as identified by header information of the input packet,

the apparatus comprising:

a plurality of input line interfaces connected with the input lines;

a plurality of output line interfaces connected with the output lines;

10   a packet switch connected between the input line interfaces and the output

line interfaces; and

a plurality of control units provided for each of the input line interfaces, each

of the control units includes:

a means for receiving packet header information from one of the input line

15   interfaces;

a flow retrieval unit which generates a flow retrieval key from the packet

header information, compares the packet header information with a plurality sets of

predetermined flow identification conditions each set of which is used for classifying

input packets into a flow and stored in one content addressable memory (CAM) of

20   the flow retrieval unit, and outputs concurrently various flow identifiers which

correspond to the retrieval key; and

a plurality of header processing units each of which has an information table

containing a plurality of information entries and receives one of the flow identifiers

outputted from the flow retrieval unit, and each of the header processing units reads

25   a single information entry from said information table according to a specific type of

flow identifier outputted from the flow retrieval unit and executes an arithmetic

operation with the information entry; and

a means for supplying control information which includes the executed

result from at least one of the header processing units, to the input line interface as a

5   source of the packet header,

wherein each of the input line interfaces has a means for rewriting a portion

of the input packet header information according to the control information received

from the control unit.

10   12. The packet forwarding apparatus as claimed in Claim 11, wherein the flow

retrieval unit further includes a memory access control unit for generating the flow

retrieval key from the header information outputted from the input line interfaces and

for concurrently accessing the CAMs with the flow retrieval key.

15   13.   The packet forwarding apparatus as claimed in Claim 10, wherein the CAMs

are accessed concurrently with the same flow retrieval key outputted from the

memory access control unit.

14.   The packet forwarding apparatus as claimed in Claim 12, wherein the plural

20   content addressable memories are concurrently accessed using the same flow

retrieval key outputted from the memory access control unit.

15.   The packet forwarding apparatus as claimed in Claim 10, wherein at least

one of the CAMs has a plurality of flow entries to be accessed with a flow retrieval

25   key other than the one used for the other CAMs; and

wherein the memory access control unit outputs the flow retrieval key in two

forms, one form having common key fields for at least one common content

addressable memory and the other form having specific key fields for at least one

specific content addressable memory, the common and specific key fields are

5   selectively inputted as a flow retrieval key to at least one of the CAMs.

16.   The packet forwarding apparatus as claimed in Claim 12, wherein at least

one of the CAMs has a plurality of flow entries to be accessed with a flow retrieval

key other than the one used for the other CAMs; and

10   wherein the memory access control unit outputs the flow retrieval key in two

forms, one form having common key fields for at least one common content

addressable memory and the other form having specific key fields for at least one

specific content addressable memory, the common and specific key fields are

selectively inputted as a flow retrieval key to at least one of the CAMs.

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17.   The packet forwarding apertures as claimed in claim1, wherein the flow

retrieval unit comprise a CAM control chip for outputting the header information to

the CAMs via at least one predetermined output pin.

20   18.   The packet forwarding apparatus as claimed in claim 17, wherein the

number of the CAMs is larger the number of the output pin.

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